CPSC-620 Computational Geometry

Fall 2003

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Course Description:  Geometric algorithms are important in design and analysis systems for physical objects ranging from buildings and automobiles to very large-scale integrated circuits. Geometric problems are easy to visualize, but that can be a liability. Many problems which can be solved instantly by a person looking at a piece of paper (example: is a given point inside a given polygon?) require nontrivial computer programs.

In the past two decades, the systematic study of geometric algorithms has evolved to form the very active field of research known as Computational Geometry. A fundamental task of computational geometry is identifying concepts, properties, and techniques which aid efficient algorithmic implementation of algorithms and the evaluation of their worst-case complexity.

The particular classes of problems that will be discussed in this course include geometric searching, convex hull construction and related problems, proximity, and intersection. We will solve these geometric problems by a variety of techniques developed recently in the field, among them are geometric sweeping, divide and conquer, refinement, reduction, geometric transformation, probabilistic methods, and parallel algorithms.

The students are required to work on a course project, which can be either (1) a theoretical research on geometric algorithms; (2) a nontrivial implementation of certain geometric algorithms; or (3) application of geometric algorithms in areas such as computer graphics.
Textbooks:


Grading: Homework 20%, project 40%, and final exam 40%.

Course Schedule: There will be four sets of homework assignment, and a course project. The Final exam will be on Tuesday, Dec. 16.